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Vital Statistics of Iceland. By P. A. SCHLEISNER, M.D., &c.*

[Read before the Statistical Society of London, 18th November, 1849.]

IN order to compute or compare the mortality in two different countries, where the calculation cannot be founded on long periods of years, it is necessary to have regard to the character of the periods used for calculation, especially in what concerns the different frequency of epidemical diseases. The life-table computed for Denmark by Professor Fenger is founded on the period 1835-44, which was a very favourable one, and free from any important epidemic. But if we look over the annual lists of deaths for Iceland, we shall soon discover that there is not a single quinquennium during which one or more severe epidemical diseases have not prevailed. The quinquennium 1840-45 is the most favourable in that point of view; but the year 1843 is marked by an epidemic of influenza, which prevailed in the middle of the year for two months, and almost doubled the number of deaths for the whole year. I have, nevertheless, used that quinquennium for my computation; but, in doing so, I have eliminated the year 1843 out of the calculation, and have used the returns for the years 1841, 1842, 1844, and 1845, for the average number of deaths at different ages.

The average numbers of the living at the same ages have been obtained from the censuses for 1840 and 1845. My table is constructed in the same manner as Fenger's, and in computing the decrement column (the second), I have used the same formula of correction as he (*vide* "Det Kongelige Medicinsk Selskabs Skrifter," bd. 1, 1848, p. 30). The two tables can therefore be compared, and I will here give the results:—

* Island undersøgt fra et largevidenskabeligt Synspunkt af. P. A. Schleisner, Dr. Med., Medlem, 1849. This work contains the tables in detail from which the results in the paper are deduced.

FOR MALES.

Age.	Of 1,000 Living at each Age, the Average Yearly Numbers Dying at the same Ages were,		Of 10,000 Children Born, the Numbers who attained the end of every Age were,	
	Iceland.	Denmark.	Iceland.	Denmark.
0.....	305·3	193·9	10,000	10,000
1.....	25·9	68·7*	6,947	8,061
3.....	3·7	25·4	6,597	7,507
5.....	3·8	8·1	6,549	7,316
10.....	5·1	5·2	6,425	7,026
20.....	10·6	7·7	6,111	6,672
30.....	13·1	10·0	5,496	6,175
40.....	19·7	15·8	4,826	5,585
50.....	22·2	25·7	3,967	4,768
60.....	51·1	49·8	3,177	3,686
70.....	92·0	101·4	1,907	2,241
80.....	172·0	207·2	759	812
90.....	....	....	135	101

FOR FEMALES.

Age.	Of 1,000 Living at each Age, the Average Yearly Numbers Dying at the same Ages were,		Of 10,000 Children Born, the Numbers who attained the end of every Age were,	
	Iceland.	Denmark.	Iceland.	Denmark.
0.....	265·5	162·8	10,000	10,000
1.....	24·2	64·5	7,435	8,372
3.....	4·2	28·1	7,084	7,832
5.....	3·2	8·3	7,024	7,612
10.....	4·3	5·9	6,912	7,301
20.....	7·5	7·3	6,628	6,884
30.....	10·0	10·5	6,155	6,396
40.....	14·0	13·2	5,569	5,756
50.....	20·9	20·1	4,841	5,044
60.....	37·8	41·5	3,932	4,124
70.....	69·6	91·9	2,694	2,722
80.....	144·0	192·0	1,343	1,085
90.....	....	....	317	158

* For the ages 1—3 and 3—5 the quotients in Fenger's table are computed in another way than in mine, and may be compared for these ages with the double of my quotients (vide l. c.).

The table for Iceland has, as above mentioned, been constructed in such a way, that the Icelandic population can be compared under the same conditions as the Danish. The table will therefore show the peculiarities attributable to the Icelanders' constitution and manner of living. It will be seen that the same laws of mortality prevail in Iceland as in Denmark, except that the mortality, even under the same favourable conditions, is much higher in Iceland. This observation, however, applies especially to the first year of life; in other

words, the highest degree of mortality in Iceland is a little earlier than in Denmark.

It will further be seen, that the mortality of females in comparison with that of males is still more favourable in Iceland than in Denmark; the reason of which I have explained in my book. The probable lifetime at birth is, in Denmark, for males, 47 years, for females, 50; in Iceland, for males, 37 years, for females, 48. But this is not the true expression for the mortality of the Icelandic population, inasmuch as epidemics have been put out of the calculation.

In Denmark, severe epidemic diseases occur very seldom; but in Iceland, they are of very frequent occurrence. In order to find the true term for the Icelandic mortality, it will therefore be necessary to take a long series of years, taking no notice of the epidemics. But here again we encounter the inconvenience, that for the earlier years the census is taken so rarely, and the annual deaths are given so little in detail, as to render the construction of a correct life-table impossible. There is, however, one circumstance stated in the Icelandic returns which makes it possible to calculate the true mortality of the Icelandic population. The lists contain, besides the whole yearly number of births and deaths, the yearly number of those who have been confirmed. Now, in Iceland, the age of confirmation (this act being there, as in Denmark, a compulsory one) has always been very constant, between 14 and 15 years.

I have availed myself of this circumstance. Starting from the year 1750, I have summed up the number of births in every quinquennial period, and have computed how many of them in every fourteen years following the quinquennium have been confirmed. In that way I have found, that, during the last century, out of 1,000 children born, 548·3, on an average, have been confirmed, *i. e.*, attained the end of 14 years; for this century, 583·6; and for the whole series of years, 569·5. This gives an enormous difference in comparison with the Danish population; for while at present, in Denmark, of 1,000 males born, 569 attain the end of 38 years; and of 1,000 females, 569 attain that of 41; in Iceland, the same number of both sexes attain only the end of 14 years.

The cause of this extraordinary mortality amongst the Icelanders may, as already suggested, be found in the frequency of epidemic diseases, of which the severity may be traced to the bad sanitary conditions of the country. As no country in Europe is afflicted in such a degree by epidemics, I shall explain this matter a little more fully, referring for further details to my book (p. 41, ff.) The Icelandic epidemics are of two kinds, partly native, that is to say, originating in the country itself, and partly foreign, that is to say, from time to time imported into the country by ships. To the first class belong typhus and influenza, which are the most frequent.

Typhus fever prevails almost every year; it does not differ from common typhus; but, besides this, there is another typhus-like fever, occasioned by famine, which has almost always followed the large volcanic eruptions, or the years of distress that from time to time have attacked Iceland.

Influenza shows in Iceland two different characters. It is either benignant, having no great influence upon the mortality, and in that

form prevailing every year; or it is more malignant, complicated with pleuritis, and thus greatly influencing the mortality. In this latter form, it has this century raged, every ninth year, with some approach to regularity.

Among the native epidemics may still be reckoned dysentery, cynanche parotideæ, scurvy, croup, and endemic cholera. Icterus has also sometimes assumed an epidemic character, having, however, no connexion with the morbus hydatidosus hepatis, which of all sporadic diseases is the most frequent in Iceland. The varioloid diseases have also been sometimes transferred as an epidemic from cows to men.

To the foreign epidemics belong small-pox, measles, scarlatina, and hooping cough, which, at intervals of twenty years and upwards, are introduced by merchant-ships to this isolated island. During the intervals, they are quite unknown. When any of these epidemics are brought to the island, the whole population is attacked, as with one stroke; thus, for instance, when the measles was brought to Iceland, three years since, that disease, which for sixty years previously had been quite unknown there, attacked the whole population, and all ages, from the child to the old man. The measles, which in Europe is a benignant disease, raged there with such fury, that the number of deaths for that year was more than doubled. In Iceland, where the mountainous ground, intercepted by numerous rivers, makes the communication very difficult, where there are no public roads at all, and where, instead of towns (with the exception of three small ones), the dwellings lie scattered at large distances, it is very easy to find out the way in which epidemic diseases propagate themselves. All the Icelandic physicians agree in stating that these last-mentioned epidemics, as they are brought to the island by contagion, are also always, and exclusively, propagated by contagion. In the Færoe Islands, which consist of a great number of scattered islets, the physicians have arrived at the same conclusion.

It is well known that the Icelanders have always been distinguished by their great interest in literary, especially in historical, studies. From an early period, they have kept yearly records, in which all remarkable accidents, both within and without the country, have been noticed; the greater part of these is still unpublished. By studying these records, I have found that, from 1306-1846, 134 years out of the 540 are mentioned as being more or less epidemic years. The epidemics that prevailed in those years were as follows:—

Foreign epidemics—Small-pox; this raged nineteen times, often for several successive years; three times in the 14th century, once in the 15th, five times in the 16th, five times in the 17th, four times in the 18th, and once in the present century. The severity of this epidemic had abated even before the introduction of vaccination. The year 1707 was the most disastrous, when the small-pox is stated to have swept away 18,000 out of a population of 52,000 inhabitants. The measles have prevailed three times only; scarlatina four times; and hooping cough four times. The plague has raged twice; first in the years 1402-3, having been brought to the country by a Norwegian ship, when two-thirds of the inhabitants perished; and again in 1493-95, when it was introduced by English ships.

In the year 1528, and in 1551, an epidemic is mentioned, called in

Iceland "*Sárasótt*." This expression is used by some Icelandic writers as synonymous with syphilis; and other circumstances lead me to believe that that was really the disease. If so, it is the more remarkable, inasmuch as syphilis, as well as gonorrhœa, do not at present exist in Iceland. Single cases are sometimes brought to the island by merchant ships, but they have been soon cured, and the diseases have never been propagated.

Of the native epidemics, the most frequent have been:—Typhus, mentioned as a severe epidemic, fifteen times; influenza, fifteen times; dysentery, five times; diseases occasioned by famine, eight times.

It may be supposed, that for the early years especially, those epidemics only have been mentioned which have had a remarkable influence on the mortality.

It was of the greatest interest to me to find out some way of determining the loss of men which these epidemics occasioned. As the yearly lists of deaths do not contain the causes of death, I could not make use of them for that purpose; I therefore tried to arrive at the result through the statistical method. By means of the annals and the yearly reports of the Icelandic physicians, I first determined which years should be considered as epidemic and which not, starting from 1750, as the period since which the reports and the yearly lists are most correct. The yearly lists contain the whole number of births and deaths, but it is only for the last ten years that the different ages are detailed. The census was taken in 1750, 1769, and 1801, and from 1835, every fifth year. I now proceeded in the following manner (the same by which the Table II. in my book has been constructed*): I first tried to find out the yearly number of inhabitants. I started from the census of 1769, and by summing up the excess of the births over the deaths, or the reverse, I computed back to 1750, and forward to 1801. As in Iceland the immigration and emigration are almost nothing, it will not appear strange that the number calculated in this way for 1801 differed very little from the real number ascertained by the census. From 1801, I computed, in the same manner, forward to 1846. The yearly number of inhabitants thus found is put in the fourth column of the table. From the mortality of eight out of the last ten years, during which *no epidemical disease prevailed* amongst the children, I then computed the ratio of mortality in the first year of life, and found it to be 300 of 1,000 children born. I convinced myself that this ratio for the *healthy* (not epidemic) years was nearly the same in the last century, by recurring to the original ministerial books in some of the most populous districts. Having thus determined for the healthy years the ratio of mortality in the first year of life, I computed how many, according to this ratio—which I will call the Normal one—out of the number born each year, have died in the first year of life (seventh column). By subtracting these from the whole number of deaths, I then found how many died above the first year (eighth column). But I must remark, that, for the *epidemic* years, the number in this column also includes those who have died of epidemic diseases in the first year itself. From this column, and the fourth column, I then computed, for all the *healthy* years, how many above

* The years in the table marked * are the epidemic years.

the first year had died out of 100 of every year's population above one year (using for that purpose the population of every preceding year). These ratios for all the healthy years are put in the ninth column. From all these ratios I then computed, separately for every century, an average ratio, which I will call the Normal ratio, for the mortality above the first year. I then computed, for all the *epidemic* years, how many would have died, according to this Normal quotient, out of every year's population above one year (tenth column). By subtracting the last numbers from those in the eighth column, for the *epidemic* years, I find the number of those who have perished by epidemics.

Every one who is acquainted with statistical matters will observe, that I, in this manner, have avoided the error so commonly committed by authors who have been obliged to recur to lists of deaths only. Yet it may be granted that my calculated result is not quite correct, as it cannot be supposed that the proportion of the number of the living at the different ages has been the same for the whole series of years. Hence it may result that the numbers for the single years are somewhat incorrect, while for the whole period, in so large a sum of numbers, the error may be considered as disappearing. For some of the single years of the century preceding 1835, I find, in the lists of deaths collected by the clergymen, that the causes of death, as well as the number of those who have died of epidemics, have been noticed; and on comparing my calculated numbers with these, I found them to agree more than I had expected.

Now the result which I have arrived at in that way is the following. The Normal mean ratio of mortality for the population above one year has been for the last century 1·2404 per cent., for this, 1·1164 per cent. The whole number of those who have perished of epidemic diseases from 1750 to 1846, is 47,622, which is an enormous sum for a population that has never exceeded 57,000 individuals. Of this number, 25,938 have died in the last century, and 21,684 in this. Of the whole number, 3,036 have died of small-pox, 2,026 of measles, 1,468 of scarlatina, and 1,932 of hooping cough, or a total of 8,462 who have perished by epidemics imported by foreign ships. Of those who have died by native epidemics, 16,441 have perished by diseases arising out of famine (whereof 6,036 in the three years succeeding the enormous volcanic eruption of the "Skaptafjeldsgökull," in the year 1783), 9,067 of influenza, and 4,867 of typhus.

If we compare the increase of the Icelandic population with that of the Danish, we shall find, that while the Danish population, from 1801 to 1845, increased 43·85 per cent., the Icelandic, for the same period, increased only 24·14 per cent. During the last century, from 1703 to 1801, the Icelandic population even decreased 6·42 per cent. During the period 1801-45, we find, in the Icelandic lists, that there have been thirteen years in which the number of deaths exceeded that of the births; while in Denmark, for the same series of years, there is only one year, 1831, in which that was the case. The epidemic in question was a very severe outbreak of intermittent fever.

It is commonly believed in Iceland that this slow increase of population may be considered as a blessing, and that the country cannot support a larger population. In order to show to what extent this

opinion is well founded, I constructed the following table, making use, for the purpose, of the annual economical lists collected by the Icelandic functionaries:—

Years.	Number of Inhabitants.	Increase or Decrease per Cent.	Number of Cows, Bullocks, and Calves.	Increase or Decrease per Cent.	Number of Sheep, Wethers, and Lambs.	Increase or Decrease per Cent.	Number of Fishing Boats.	Increase or Decrease per Cent.
1703....	50,444	....	38,760	....	278,992	....	....	....
1770....	46,839	— 7·1	31,179	—19·5	378,677	+ 35·7	1,869	....
1783....	48,663	+ 3·9	21,457	—31·2	232,731	—38·5	....	....
1804....	46,349	— 4·8	20,325	— 5·3	218,818	— 6·0	2,163	+15·7
1823....	50,090	+ 8·1	25,364	+24·8	402,508	+84·0	2,175	+ 0·6
1833....	56,656	+13·1	27,862	+ 9·8	568,607	+41·3	2,457	+13·0
1843....	57,180	+ 0·9	23,753	—14·7	606,536	+ 6·7	2,911	+18·5
Increase or decrease for the whole series of years, 1703—1843.....		+13·4 per cent.	....	—38·7 per cent.	....	+117·4 per cent.	....	+55·7 per cent.

It will hence be seen, that while the population in the whole series has increased 13·4 per cent. only, the number of sheep, which is the real capital wealth of the country, has increased 117·4 per cent., and the number of fishing boats (indicating the increase of the fishery itself), 55·7 per cent. As a high degree of mortality may always be considered as a great misfortune to a country, so I have convinced myself that the reason why the fishery in Iceland does not give so much profit as it might do, is because the boats cannot be manned with a sufficient number of adult males. For the same reason, the Icelandic industry is worth nothing, though the country abounds in materials which might be advantageously worked into articles of manufacture.

I shall still furnish some further details to illustrate the statistics of Iceland. I believe that there is no country in Europe where the number of those who perish every year by drowning is so high as in Iceland. This results from fishing being the main occupation of the people. As the greater part of those who perish by drowning in Iceland are males, between 15 and 60 years of age, I have considered that circumstance in constructing the following table, in which I have made the comparison between Denmark, Iceland, and the Færoe Islands:—

	Iceland.	Færoe Islands.	Denmark.
Total number drowned from 1835-44	530	41	2,503
Average yearly number drowned	53	4	250
Number of inhabitants on an average of the census 1835, 40, and 41	57,229	7,314	1,284,817
Drowned out of 100,000 living individuals	92·6	56·1	19·5
Drowned out of 100,000 males living, between 15 and 60 years	351·6	196·9	67·3

It will hence be seen that the proportion of the drowned is more than five times as large in Iceland as in Denmark. If we compare the number of drowned in Iceland with the total number of deaths, it will be found that the proportion is 25·4 per cent. out of the total yearly number of males dying between 15 and 60 years of age.

Iceland is divided into seventeen different districts. I have continued the computation for all those districts, and the number thus found indicates in the most correct manner where the best fishing places are to be found, and their yearly profit. I am inclined to believe that the rates which the fishing-places are obliged to pay yearly to the Government, according to the greater or less profit of the fishery, are not paid with such an accuracy as the rate which the sea yearly enforces. I have also compared the proportion of other violent deaths (excepting suicides) to the population in Iceland, Färoe Islands, and Denmark, and found it to be, out of 100,000 living individuals, 22·9, 32·8, and 13·5, respectively. Here the proportion is highest in the Färoe Islands. The reason for this is, that, next to the fishery, bird-catching is here the first employment of the people; but this occupation is very dangerous, as the birds build their nests on the high craggy rocks, of which these small islands consist.

Almost all the foreigners who have travelled in Iceland have mentioned the extraordinary fecundity of the nation as something remarkable. It is noticed that marriages with twenty children and upwards occur frequently. But from such single facts, a general rule for the fertility of the nation cannot be deduced. I have tried to find it out. The fertility of a nation is commonly indicated by the proportion of the children born to the whole population. Dr. Kayser, Professor of Statistics at the University of Copenhagen, has made a correction in that test. Instead of fixing the births in proportion to the whole population, he fixes them in proportion to the whole number of women at the fertile age (which, for the northern countries, is between twenty and fifty years). In the above-mentioned treatise ("Det Kongelige Medicinske Selskabs Skrifter," bd. 1, 1848, p. 172 ff.), he explains that matter more in detail. He especially mentions the error so commonly committed in indicating the morality of a town or country by the proportion of the illegitimate births to the legitimate. The last number is never constant, but depends upon the fluctuation of the marriages; when the marriages increase, the number of illegitimate births will be proportionately reduced; and when the marriages decrease, the number will be raised, though perhaps the real relation is quite otherwise. To compute that proportion, it will, according to Dr. Kayser, be necessary to compare the number of illegitimate births with the number of *unmarried* women living at the fertile age. In that manner he has computed the proportion at different periods, for the towns in Denmark, with a result very different from that found out by the method commonly used. But it may still be granted, that even with that correction, the term is not quite correct. It will be seen from the Swedish lists of births and deaths, which contain, besides the number of children born, also the ages of the lying-in women, that the fertility is different at different ages, being, for instance, in Sweden, highest between thirty and thirty-five years. Now it may very well happen that two nations, even if they contain

the same number of fertile women, may contain a different fraction of them at the most fertile age, and also that the ratios of fertility—if I may so express myself—may differ at the various ages. It will therefore be necessary to construct the tables for the fertility in the same manner as for the mortality, unless we follow the method indicated by Moser, who recurs to the marriages and life-tables.

In Denmark, as well as in Iceland, the lists of births are still not so detailed as in Sweden; for this reason, I restrict myself to the method indicated by Dr. Kayser. I shall make the comparison between the results obtained by Dr. Kayser for Denmark, and mine for Iceland. Kayser's computation is founded on the series of years partly from 1830-44, partly from 1827-44; mine is founded on the ten years 1838-47.

	Average Yearly Number of Births.	Average Number of Women between 20 and 50 Years.	Proportion of Births to 100 Women between 20 and 50 Years.
Denmark	39,878	262,871	15·2 per cent.
Iceland	2,054	12,117	16·9 ,,
	Average Yearly Number of Legitimate Births.	Average Number of Married Women between 20 and 50 Years.	Proportion of Legiti- mate Births to 100 Married Women between 20 and 50 Years.
Denmark	35,666	150,985	23·6 per cent.
Iceland	1,774	6,287	28·2 ,,
	Average Yearly Number of Illegitimate Births.	Average Number of Unmarried Women between 20 and 50 Years.	Proportion of Illegiti- mate Births to 100 Unmarried Women between 20 and 50 Years.
Denmark	4,213	111,886	3·77 per cent.
Iceland	280	5,830	4·8 ,,
	Average Yearly Number of Boys born.	Average Yearly Number of Girls born.	Proportion of Boys to 100 Girls born.
Denmark	20,227	19,140	105·7 per cent.
Iceland	1,056	997	106·0 ,,
	Proportion of Twins to 100 of the whole Number of Births.	Proportion of Triplets to 100 of the whole Number of Births.	
Denmark.....	1·23 per cent.	0·015 per cent.	
Iceland.....	1·43 ,,	0·095 ,,	

It will hence be seen that the fertility of the Icelandic women, both married, and especially unmarried, is a great deal greater than that of the Danish, but that the population, in point of fertility, is not so well composed as the Danish. In Denmark, the number of married women out of the whole number of fertile women is 57·4 per cent.; while in Iceland it is only 51·9 per cent. It will be seen from the above table, that the number of male births exceeds that of female births in a higher degree in Iceland than in Denmark. I have already shown that the probable lifetime of the Icelandic females in relation to the males is still better than in Denmark; hence it will not excite wonder to find, that, in the Icelandic population, the proportion of the males to the females is as 1,000 to 1,120; while the proportion in Denmark is as 1,000 to 1,023. The proportion of still-born children is more favourable in Iceland than in Denmark, as will be seen by the following table:—

	Average Yearly Number of all Births.	Average Yearly Number of Still-Born Children.	Proportion per Cent.
Denmark	40,536	1,767	4·4 per cent.
Iceland	2,054	67	3·3 „

	Average Yearly Number of Male Births.	Average Yearly Number of Still-Born Males.	Proportion per Cent.
Denmark	20,833	1,019	4·9 per cent.
Iceland	1,057	38	3·6 „

	Average Yearly Number of all Girls born.	Average Yearly Number of Still-Born Girls.	Proportion per Cent.
Denmark	19,703	748	3·8 per cent.
Iceland	997	29	2·9 „

It is also the case in Iceland, as elsewhere, that this proportion is less favourable in the illegitimate births than in the legitimate.

As Iceland, in several respects, affords so many peculiarities, it would perhaps be interesting to mention the results of the nosographical part of my treatise, also founded on statistical researches; but as Dr. Latham has promised to make an abstract of the whole treatise in the “British and Foreign Medical Review,” I will omit it here.